

## **A New Species and A New Record of Halacarid Mites (Acari: Halacaridae) from Jeju Island, Korea**

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### **ABSTRACT**

Two species of halacarid mites belonging to genus *Copidognathus* viz *C. jejuensis* n. sp. and *C. polyporus* Bartsch, 1991 are described on the basis of the specimens collected from an algal bed in Jeju Island, Korea. *Copidognathus jejuensis* n. sp. is closely related with *C. dentatus* Viets, *C. dentipes* Bartsch and *C. eblingi* Chatterjee. Morphological similarities and dissimilarities among them are discussed. *Copidognathus polyporus* Bartsch is reported for the first time from Korea and away from its type locality. A key to the species of genus *Copidognathus* from Korea is provided.

Key words: taxonomy, Acari, Halacaridae, *Copidognathus*, new species, Jeju Island, Korea

### **INTRODUCTION**

Halacarid mites are the important component of marine meiofauna. Halacaridae is poorly known from Korea although lots of works have been done from different adjacent areas like Japan, Hong Kong and the southern China, and the Philippines. To fill this lacunae the present authors have collected halacarids from the coast of Korea, and recently four marine halacarid species viz. *C. cerberoideus* Bartsch, *C. koreanus* Chatterjee and Chang, *C. laevisetosus* Chatterjee, Lee and

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Chang, and *Simognathus coreensis* Chatterjee and Chang were described by the present authors from Korea (Chatterjee and Chang, 2003, 2004; Chatterjee et al., 2004). As a sequel of the faunistic studies above this study deals with *Copidognathus jejuensis*, a new species, and *C. polyporus* Bartsch, 1991, a new record from Korea.

## MATERIALS AND METHODS

Materials examined in the present study were collected from an algal bed at the intertidal rocky shore of Jeju Island, South Korea. Samples were filtered through a nylon net (64  $\mu\text{m}$  in pore diameter) after anesthetizing halacarid mites with 7%  $\text{MgCl}_2$  solution for about 30 minutes, rinsed with freshwater for osmotic shock, and then fixed and stored in 80% ethanol.

Halacarids were cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida. Type specimens are deposited in the Department of Biology (DB), Daegu University, Korea.

Abbreviations used in the text and figure legend: AD, anterior dorsal plate; AE, anterior epimeral plate;  $\text{ds}_{1-6}$ , dorsal setae 1-6 on idiosoma; EPI-II, epimeral processes I-II; GA, genitoanal plate; GO, genital opening; mc, membranous cuticle between different plates; OC, ocular plate; PD, posterior dorsal plate; PE, posterior epimeral plate; PGS, perigenital setae;  $\text{P}_{1-4}$ , first to fourth palpal segment; SGS, subgenital setae.

## SYSTEMATIC ACCOUNTS

Family Halacaridae Murray, 1877

Subfamily Copidognathinae Bartsch, 1983

Genus *Copidognathus* Trouessart, 1888

### \**Copidognathus jejuensis* n. sp. (Figs. 1, 2)

**Material Examined.** Holotype male (DB50024), Jocheon, Jeju Is., Korea, 25 Jan. 2003 (C. Y. Chang and J. M. Lee), among coralline algae. Paratype male (DB50025), collection data same as in holotype.

**Description.** Holotype male: All dorsal plates separate. Idiosoma (Fig. 1A) 355  $\mu\text{m}$  long. AD anteriorly with small protuberance. AD 104  $\mu\text{m}$  long and 95  $\mu\text{m}$  wide. AD with 3 areolae, consisting of 1 anterior and 2 posterior crescent-shaped; posterior two with about 20 rosette pores (Fig. 2D). Paired  $\text{ds}_1$  anterior to posterior areolae on AD. Pair of gland pores near anterolateral margin of AD;  $\text{ds}_2$  on mc between AD and OC.

OC (Fig. 1C) 100  $\mu\text{m}$  long and 47  $\mu\text{m}$  wide; length to width ratio of OC about 2.1; with 2 corneae; rosette pores present on corneal zone; gland pore lateral to posterior cornea; pore canalicula present nearly on lateral margin of OC; posterior portion of OC with numerous panels (Fig. 2C). Brownish pigment found on upper cuticular layer near corneal zone.

PD (Fig. 1A) 225  $\mu\text{m}$  long and 163  $\mu\text{m}$  wide, truncate anteriorly. PD with 4 costae; middle costae 2 rosette pores wide, while lateral costae 1 rosette pore wide; 5–6 panels wide between two middle costae (Figs. 1A, 2H), while about 3–4 panels between middle and lateral costae (Figs. 1A, 2G); lateral costae about 1–2 panels away from lateral margin of PD.  $ds_3$  present on anterior side of PD; distance from  $ds_3$  to  $ds_4$  84  $\mu\text{m}$  and  $ds_4$  to  $ds_5$  55  $\mu\text{m}$ ; distance between  $ds_3$  and  $ds_4$  1.5 to 1.7 times than between  $ds_4$  and  $ds_5$ . Pair of gland pores (Fig. 1A, 2F) present beside middle costae posteriorly on PD. Distance between  $ds_5$  and posterior gland pore on PD 27  $\mu\text{m}$  in one side while 33  $\mu\text{m}$  in other side.  $ds_6$  on anal cone locating dorsally.

All ventral plates separate. AE (Fig. 1B) 129  $\mu\text{m}$  long and 224  $\mu\text{m}$  wide. EPI cervical origin, elongated. AE porose, with 3 pairs of setae; canaliculi arranged in groups (Fig. 1F). Epimeral pore present below second coxa. PE with 3 ventral and 1 dorsal setae.

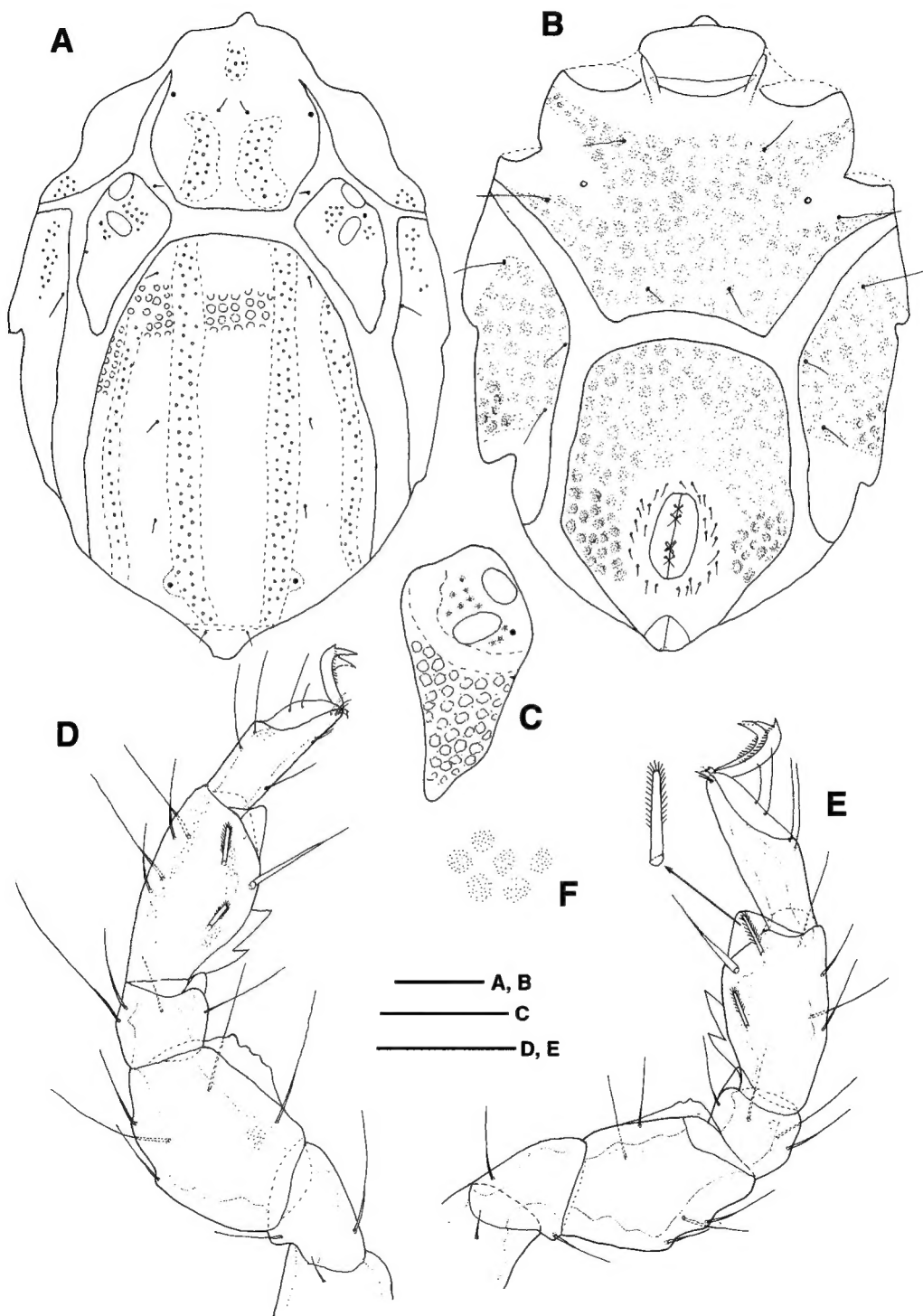
GA (Fig. 1B) 174  $\mu\text{m}$  long and 69  $\mu\text{m}$  wide. GO 46  $\mu\text{m}$  long, surrounded by 28 PGS. Four pairs of SGS present; first, second and fourth pairs thin while third pair thick and spur type. Distance between anterior end of GO to that of GA about 1.8 times of GO length. Porose panels little darker in paragenital areolar region (Figs. 1B, 2E). Spermatopositor as shown in Fig. 2J.

Gnathosoma (Fig. 2I) 110  $\mu\text{m}$  long and 60  $\mu\text{m}$  wide. Rostrum tip extending above middle of  $P_3$ . Rostral sulcus long beyond tritrostral seta. Palp consisting of 4 segments.  $P_1$  and  $P_3$  devoid of any seta.  $P_2$  with 1 dorsal seta distally.  $P_4$  with 3 long basal setae and 1 minute distal seta. Ventrolateral side of gnathosoma porose. Proto- and deuterostral setae at tip of rostrum; tritrostral setae situated ahead middle of rostrum; pair of long basirostral setae present. Tectum truncate.

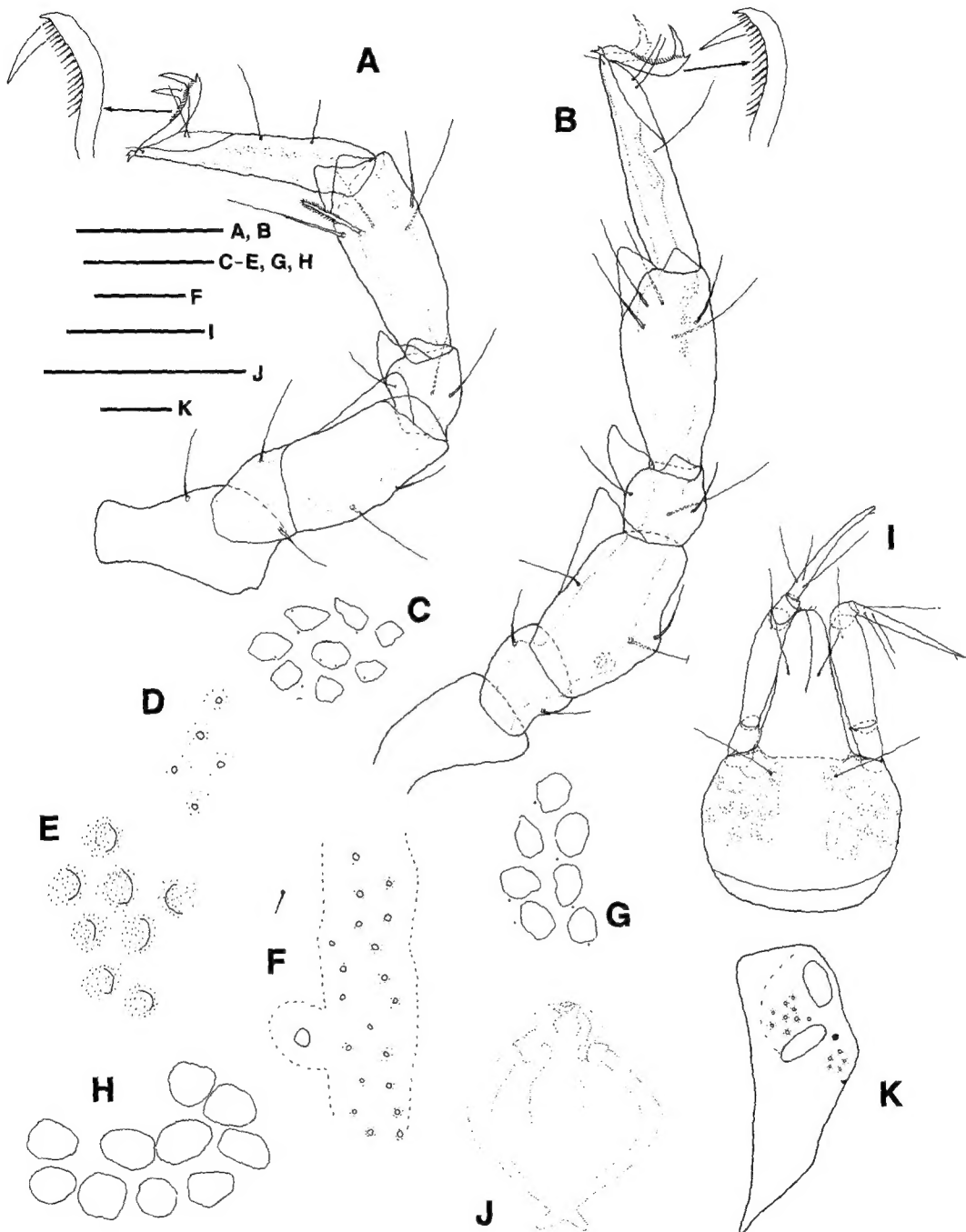
Chaetotaxy of legs: trochanter 1-1-1-0; basifemur 2-2-2-2; telofemur 5-5-2-3; patella 4-4-3-3; tibia 7-7-5-5; tarsus (PAS excluded) 7-4-4-3. Tibiae I and II each with 2 denticulate processes proximoventrally (Fig. 1D, E). Telofemora, patella, tibiae of all legs with well developed ventrodistal and distal lamellae. Lateral edge of ventrodistal lamella of tibia I uneven. Telofemur III with 2 dorsal setae, devoid of any ventral seta (Fig. 2A). Telofemur IV with 2 dorsal setae and 1 ventral seta (Fig. 2B). Tibiae I and II with 4 dorsal setae and 3 ventral (2 pectinate and 1 smooth) setae. Tibia III with 2 dorsal, 1 ventromedial and 2 ventral (1 pectinate and 1 smooth) setae. Tibia IV with 2 dorsal, 1 ventromedial and 2 ventral setae, all setae smooth. Tarsus I with 3 dorsal setae, 1 solenidion, 3 ventral setae and 2 eupathidia doublets. Tarsus II with 3 dorsal setae, 1 solenidion, 2 eupathidia doublets, lacking any ventral seta. Tarsus III with 4 dorsal setae; distance between 2 basal setae subequal with height of tarsus. Tarsus IV with 3 dorsal setae. All legs with 2 lateral claws and 1 bidentate median claw. Lateral claws with accessory process dorsally, pectinate ventrally. Lateral claws of legs II–IV with about 15–20 pectines.

**Variability.** Morphological variations were examined between the holotype and the paratype: in the holotype the middle costa on PD uniformly 2 rosette pores wide, while in the paratype in the middle place 2 and on anterior and posterior end 1 rosette pore wide; in the holotype the distance between anterior end of GO to that of GA about 1.8, while in the paratype about 1.6; the lateral claw of legs II to IV comprising 15–20 pectines in the holotype (Fig. 2A, B), while 20–25 in the paratype; the length of GO slightly varies, ranging 42–46  $\mu\text{m}$  between two specimens.

**Remarks.** In having the character combination of two posterior areolae on AD;  $ds_2$  on mc between AD and OC; PD with 4 costae; telofemora, patella and tibiae with distal lamellae; tibiae I and II with 2 denticulate processes proximoventrally; tarsi III and IV with 4 and 3 dorsal setae



**Fig. 1.** *Copidognathus jejuensis* n. sp., holotype male. A, idiosoma, dorsal; B, idiosoma, ventral; C, OC; D, leg I; E, leg II; F, portion of porose area on AE. Scale bars= 50  $\mu$ m (A-E).



**Fig. 2.** A-J, *Copidognathus jejuensis* n. sp., holotype male: A, leg III; B, leg IV; C, panels on OC; D, rosette pores of posterior areolae on AD; E, porose panels on paragenital areolar area; F, part of middle costa on PD, showing gland pore near  $ds_5$ ; G, panel between middle and lateral costae; H, panels between two middle costae; I, gnathosoma; J, spermatopositor. K, OC (panels not shown) of *C. eblingi* Chatterjee (male from Andaman Island, India). Scale bars = 20  $\mu$ m (C-G, H, K), 50  $\mu$ m (A, B, I, J).

respectively, this species is allied with *C. punctatissimus* (Gimbel) from North America (Gimbel, 1919; Newell, 1947), *C. dentatus* Viets from Adriatic Sea and the United Kingdom (Viets, 1940; Green and Macquitty, 1987), *C. dentipes* Bartsch from Hawaiian Island (Bartsch, 1989), *C. eblingi* Chatterjee from Andaman Is., India (Chatterjee, 1991; Chatterjee and Annapurna, 2003) and *C. pesident* Bartsch from Moorea and Bora Bora Is., Society Islands (Bartsch, 1992a).

*Copidognathus jejuensis* n. sp. is clearly differentiated from *C. dentatus*, *C. pesident* and *C. punctatissimus* by the much bigger lamella on telofemora, patella and tibiae of all legs. This new species possesses more elongated posterior areolae on AD than in *C. punctatissimus*. The distance between  $ds_3$  and  $ds_4$  is 1.5 to 1.7 times farther than the distance between  $ds_4$  and  $ds_5$  in *C. jejuensis* n. sp., while the former is subequal with the latter in *C. punctatissimus*. The present species also differs from *C. dentatus* and *C. punctatissimus* in having 0:1 ventral seta on telofemora III and IV (1:1 in *C. dentatus* and *C. punctatissimus*). Furthermore, the shape of OC is apparently distinct between those of the new species and *C. pesident* (posteriorly blunt in *C. jejuensis*, while narrow and pointed in *C. pesident*).

*Copidognathus jejuensis* n. sp. is also distinguished from *C. dentipes* by the rather truncate and wide anterior margin of PD (against ovate in *C. dentipes*), the different distances among the dorsal setae (the distance between  $ds_3$  and  $ds_4$  is 1.5-1.7 times farther than the distance between  $ds_4$  and  $ds_5$  in *C. jejuensis*, while subequal in *C. dentipes*), the closeness between PGS and GO in male (the distance from anterior margin of GO to anterior PGS is about half the length of GO in *C. dentipes*, while much closer in *C. jejuensis*), and the different relative distance between anterior end of GA and GO in male (the distance between anterior end of GO to that of GA is about 1.6-1.8 times of GO length in *C. jejuensis*, while about 1.2 in *C. dentipes*).

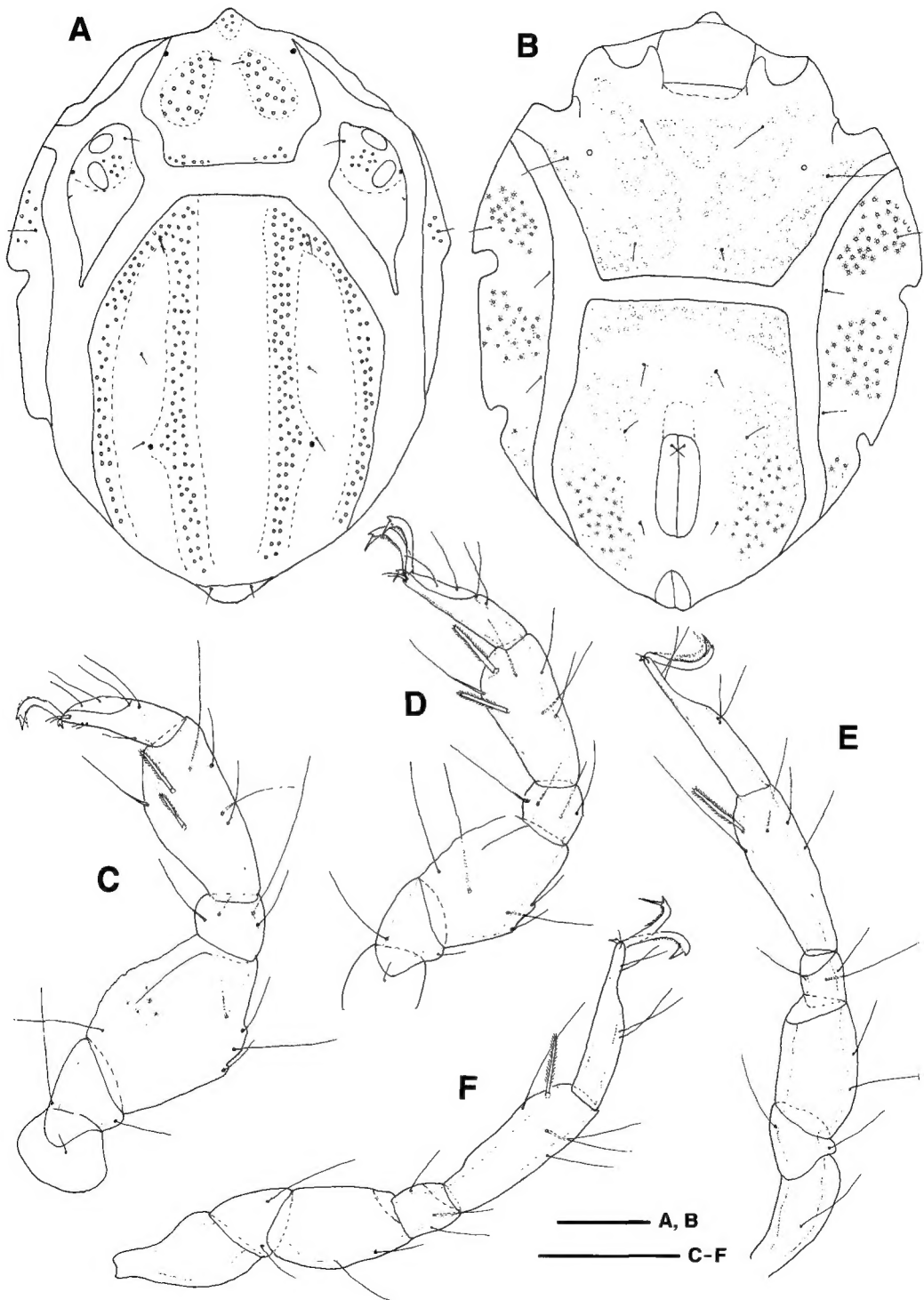
*Copidognathus jejuensis* n. sp. most closely resembles *C. eblingi* Chatterjee from Andaman Is., India. However, they showed some discrepancies on the following points: idiosoma length of male ranged between 260-295  $\mu$ m in *C. eblingi*, while 330-355  $\mu$ m in *C. jejuensis*; the distance between anterior end of GO to that of GA in male about 1.2-1.5 times of GO length in *C. eblingi*, while about 1.6-1.8 in *C. jejuensis*; a little slender OC (length to width ratio of OC is 2.7-2.9) with the sharply narrowed posterior end in *C. eblingi*, while the wider OC (length to width ratio of OC about 2.1) with the blunt posterior end in *C. jejuensis* (Figs. 1C, 2K; Chatterjee and Annapurna, 2003, Fig. 2F); the lateral claws of legs II-IV bearing about 10-13 pectines in *C. eblingi* while 15-25 in *C. jejuensis*; EPL more elongated in *C. jejuensis* than in *C. eblingi*.

#### \**Copidognathus polyporus* Bartsch, 1991 (Fig. 3)

*Copidognathus polyporus* Bartsch, 1991, p. 181, figs. 25-37.

**Material examined.** 4 ♀♀, 4 ♂♂, Jocheon, Jejudo Is., 25 Jan. 2003 (C. Y. Chang and J. M. Lee), among coralline sediments.

**Description.** Female: Idiosoma of females 313  $\mu$ m to 330  $\mu$ m. All dorsal plates separate. AD (Fig. 3A) with 1 small anterior areola and 2 big posterior areolae, locating in the middle of AD, each containing about 20 rosette pores. Near posterior margin of AD a few rosette pores present.  $ds_1$  on anterior side of middle areolae on AD. Pair of gland pores at anterolateral side of AD almost at



**Fig. 3.** *Copidognathus polyporus* Bartsch, female. A, idiosoma, dorsal; B, idiosoma, ventral; C, leg I; D, leg II; E, leg III; F, leg IV. Scale bars = 50  $\mu$ m (A-F).

level of  $ds_1$ .  $ds_2$  near anterior margin of OC. PD with 4 costae, 2 middle costae 2-3 rosette pores wide. Lateral costa and middle costa joining anteriorly. Distance between  $ds_3$  and  $ds_4$  about 1.5 to 1.6 times than between  $ds_4$  and  $ds_5$ .

Arrangement of pores on AE leaving 'Y'-shaped area in middle (Fig. 3B). EPI and EPII well developed and coxal origin. Distance from anterior end of GO to that of GA about 1.3 times of GO length. Three pairs of PGS and 1 pair of SGS present. Ovipositor short.

Ventrolateral side of gnathosoma with rosette pores. Rostrum short, not reaching distal end of  $P_2$ . Pair of proto- and deutorostrals setae at tip of rostrum; tritrostrals setae situated on anterior half of rostrum; basistrostrals setae below base of rostrum on gnathosoma. Palp consisting of 4 segments.  $P_1$  and  $P_3$  without any seta,  $P_2$  with 1 seta distodorsally and  $P_4$  with 3 long setae basally and 1 minute seta distally.

Chaetotaxy of legs (Fig. 3C-F): trochanter 1-1-1-0; basifemur 2-2-2-2; telofemur 5-5-2-2; patella 4-4-3-3; tibia 7-7-5-5; tarsus (PAS excluded) 7-4-4-4. Tibiae I and II with 4 dorsal and 3 ventral (2 pectinate and 1 smooth) setae. Tibiae III and IV with 2 dorsal, 1 ventromedial and 2 ventral (1 smooth and 1 pectinate) setae. Telofemora III and IV with 2 dorsal setae and devoid of any ventral seta. Tarsi III and IV with 4 dorsal setae, of which 2 basal setae close each other (Fig. 3E, F).

**Male.** Idiosoma ranging from 319  $\mu$ m to 331  $\mu$ m in length. GO 44-48  $\mu$ m long; distance between anterior end of GO to that of GA about 1.35-1.45 times of GO length; 26-27 PGS and 4 pairs of SGS present.

**Remarks.** This species was described by Bartsch (1991) on the basis of the specimens collected among the sediments, echinoids, serpulids and algal tufts from the Hoi-ha, Tolo Channel in Starfish Bay, Hong Kong. This species can be easily recognized by the 'Y'-shaped smooth area on AE; PD with 4 costae made up of rosette pores; tarsi III and IV with 4 dorsal setae, of which the basal 2 setae close each other. The present species very closely related with *C. neptuneus* Bartsch recorded from Hong Kong (Bartsch, 1992b). However, *C. neptuneus* has very long  $ds_4$  and  $ds_5$ , and middle costa on PD covered with porose panels instead of rosette pores in the region between  $ds_5$  and the distal fifth of PD.

Specimens from Korea are well coincided with the original description. We record this species for the first time from Korea and away from its type locality.

**Distribution.** Hong Kong, Korea.

#### A key to the species of genus *Copidognathus* from Korea

1. Patella I and II with 2 setae ..... *C. cerberoideus* Bartsch, 1991  
     Patella I and II with 4 setae ..... 2
2. AE porose but with 'Y'-form smooth area in the middle ..... *C. polyporus* Bartsch, 1991  
     AE porose and devoid of 'Y'-shaped smooth area in the middle ..... 3
3. Tibiae I and II with two ventral denticulate processes ..... *jejuensis* n. sp.  
     Tibiae I and II devoid of ventral denticulate process ..... 4
4. Tibia II with smooth ventral setae only  
     ..... *C. laevisetosus* Chatterjee, Lee and Chang, 2004  
     One of the ventral setae on tibia II pectinate ..... *C. koreanus* Chatterjee and Chang, 2003



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## 제주산 찐물응애류 (응애목: 찐물응애과)의 1신종 1미기록종

타파스 채터지 · 장 천 영<sup>1</sup>(인도 Indian School of Learning 생물학과; <sup>1</sup>대구대학교 자연과학대학 생명과학전공)

## 요 약

제주 해안의 조간대 해조틈에서 채집한 찐물응애과의 1신종과 1 한국미기록종을 기록한다. 신종인 제주뽕족입찐물응애 (*Copidognathus jejuensis* n. sp.)는 *C. dentatus*, *C. eblingi*, *C. dentipes* 등과 밀접한 형태적 유사성을 보여주고 있다. 이들 종과 신종간의 형태적 유사점과 상이점들을 고찰하였다. 한국미기록종인 곰보뽕족입찐물응애 (*C. polyporus*)는 모식산지 외의 지역에서는 최초로 보고된다. 지금까지 한국에서 기록된 뽕족입찐물응애속의 5종에 대한 검색표를 작성하였다.